Amendment

In response to the Office Action of September 17, 2001, please amend the above-identified application to read as follows:

IN THE SPECIFICATION:

Please substitute the following paragraph for the paragraph starting at page 1, line 13 and ending at line 7. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--In an positioning system of nanometer order for use in a semiconductor exposure apparatus or a high precision processing machine, heat generation in a linear motor, which is a driving source, has an adverse influence on the positioning process. More specifically, the heat generation may cause thermal deformation of the structure of the machine and a temperature rise of air, which may result in a measurement error in a position measuring laser interferometer. It may also cause degradation of the positioning precision of the apparatus in which the linear motor is incorporated. For example, with a temperature rise of only 1°C, a low thermal expansion material (thermal expansion coefficient lx 10^{-6}) of a size 100 mm may deform by 100 nm. Also, with a change of only 1°C or less in the temperature of air at the light path of an optical-interferometer distance gauge, an error of 100 nm may be produced in the measured value. In consideration of this, some measures should be taken to prevent such temperature change and, in this respect, a linear motor has to be cooled. Particularly, any heat produced from the linear motor should be collected.--

Please substitute the following paragraph for the paragraph starting at page 2, line 8 and ending at line 17. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--On the other hand, in order to improve the performance of an apparatus, enlargement of the output power of a linear motor has been desired. If the electric current to be supplied to coils of the motor is made larger at this end, the amount of heat generation becomes larger. It requires enlargement of the cooling capacity. The enlargement of the cooling capacity is important also with respect to prevention of damage to the coil wires or an increase in coil resistance due to a coil temperature rise.--

Please substitute the following paragraph for the paragraph starting at page 2, line 18 and ending at page 3, line 1. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--Figure 15 is a sectional view of a structure of a conventional linear motor having cooling means. As illustrated, the linear motor comprises a coil l and permanent magnets 3 fixed to yokes 2 on the opposite sides of the coil l. The coil l is surrounded by a jacket 9, which comprises thin sheets 4 and 4' and a frame 5. The coil 1 is fixed to the frame 5 by means of a fixing element 7. The jacket 9 is structured so that a cooling medium flows through an inside space 6 thereof, to collect heat produced at the coil l.--

Please substitute the following paragraph for the paragraph starting at page 3, line 2 and ending at line 18. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--Figure 16 is a sectional view of a linear motor of another example. In this linear motor, an electric current flows through a coil 1 (lateral in 5 the drawing) disposed in a magnetic field (longitudinal in the drawing) produced by permanent magnets 3, which are fixed to yokes 2. In response to it, the coil l and the magnets 3 are relatively moved in a direction perpendicular to the sheet of the drawing. In order to collect heat produced from the coil 1, the coil l is enclosed by a jacket having portions 14 and 14'. A cooling medium flows through a clearance between the coil 1 and the jacket, by which the heat is collected. In order that the distance between the permanent magnets 3 is made smaller and the produced magnetic density is made larger for enlargement of the linear motor thrust, the jacket is made thin.--

Please substitute the following paragraph for the paragraph starting at page 3, line 19 and ending at page 4, line 5. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--In these examples, however, if the flow rate of the cooling medium is made larger to increase the cooling capacity, the resultant pressure rise of the cooling medium may cause outward deformation of a small-thickness portion of the jacket. It may result in contact with the permanent magnet or breakage of the jacket. To avoid this, the small-thickness portion of the jacket should have a sufficient strength. To the contrary, to increase the output power of a linear motor, the distance between permanent magnets has to be made small to enlarge the magnetic density. In this respect, the small-thickness portion of the jacket should be made thin as much as possible to reduce the size of the jacket.--

Please substitute the following paragraph for the paragraph starting at page 4, line 6 and ending at line 14. A marked-up copy of this paragraph, showing the changes made thereto is attached.

a1 cncld.

--Further, in a case of a multiple-phase linear motor having coils being arrayed along a direction perpendicular to the sheet of the drawing of Figure 16, the coil and jacket structure extends in a direction perpendicular to the sheet of the drawing. In this example, the natural frequency of the structure should be made large to reduce the adverse influence on a high-precision positioning system in which the linear motor is incorporated.--

Please substitute the following paragraph for the paragraph starting at page 4, line 22 and ending at line 26. A marked-up copy of this paragraph, showing the changes made thereto is attached.

a2

--It is another object of the present invention to provide an invention to provide a linear motor structure and/or a stage system with the same wherein a coil and jacket structure has an enlarged natural vibration frequency.--

Please substitute the following paragraph for the paragraph starting at page 4, line 27 and ending at page 5, line 3. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--It is a further object of the present invention to provide an exposure apparatus and/or a device manufacturing system that uses a linear motor structure or a stage system such as described above.--

Please substitute the following paragraph for the paragraph starting at page 5, line 4 and ending at line 11. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--In accordance with an aspect of the present invention, there is provided a linear motor, comprising: a magnet; a coil; and a jacket having an inside comb-shaped member extending along a driving direction, wherein the coil is engaged by teeth of the comb-shaped member and wherein a cooling medium flows through an inside space enclosed by the jacket.--

a2 cont.

Please substitute the following paragraph for the paragraph starting at page 5, line 12 and ending at line 20. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--The comb-shaped member may include base portions provided on mutually opposed inside faces of the jacket and formed in parallel to the driving direction and to be opposed to each other, and a pillar-like portion for connecting the base portions, wherein the coil may be supported by said base portions in a floating manner while it may be held fixed by the pillar-like portion with respect to the driving direction.--

Please substitute the following paragraph for the paragraph starting at page 5, line 21 and ending at line 27. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--The linear motor may include a plurality of coils arrayed along the driving direction partially overlapping each other, wherein each coil may have a bent end portion to avoid mutual

interference of the partially overlapped portions of the coils, and wherein the coils may be disposed with their central portions placed substantially at the same level.--

a2 cont.

Please substitute the following paragraph for the paragraph starting at page 6, line 1 and ending at line 6. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--The jacket may have a central portion of a small thickness with an outside recessed portion, wherein the bent end portions of the coils may be disposed at the recessed portion, and wherein the central portion of small thickness may be reinforced by the recessed portion.--

Please substitute the following paragraph for the paragraph starting at page 6, line 7 and ending at line 8. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--The jacket may serve as a guide for an element to be driven by the linear motor.--

Please substitute the following paragraph for the paragraph starting at page 6, line 9 and ending at line 17. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--In accordance with another aspect of the present invention, there is provided a stage system, comprising: a movable stage; a linear motor having a magnet and a coil, for driving the stage; and a jacket having an inside member that is comb-shaped, extending along a driving direction, wherein the coil is engaged by teeth of the comb-shaped member and wherein a cooling medium flows through an inside space enclosed by the jacket.--

Please substitute the following paragraph for the paragraph starting at page 6, line 18 and ending at line 27. A marked-up copy of this paragraph, showing the changes made thereto is attached.

a2 cont.

--In accordance with a further aspect of the present invention, there is provided an exposure apparatus, comprising: a movable stage for holding a substrate thereon; a linear motor having a magnet and a coil, for driving the stage; and a jacket having an inside member that is comb-shaped, extending along a driving direction, wherein the coil is engaged by teeth of the comb-shaped member and wherein a cooling medium flows through an inside space enclosed by the jacket.--

Please substitute the following paragraph for the paragraph starting at page 7, line 1 and ending at line 13. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--In accordance with a yet further aspect of the present invention, there is provided a device manufacturing method, comprising the steps of: applying a photosensitive material onto a substrate; exposing the substrate by use of an exposure apparatus including a movable stage for holding a substrate thereon, a linear motor having a magnet and a coil, for driving the stage, and a jacket having an inside member that is comb shaped, extending along a driving direction, wherein the coil is engaged by teeth of the comb-shaped member and wherein a cooling medium flows through an inside space enclosed by the

jacket; and developing the exposed substrate.--

Please substitute the following paragraph for the paragraph starting at page 7, line 14 and ending at line 20. A marked-up copy of this paragraph, showing the changes made thereto is attached.

a2 cancel.

--In accordance with a still further aspect of the present invention, there is provided a linear motor, comprising: a magnet; a coil; and a jacket having a reinforcement portion extending parallel to a driving direction, wherein the coil is enclosed by the jacket and wherein a cooling medium flows through an inside space of the jacket.--

Please substitute the following paragraph for the paragraph starting at page 7, line 21 and ending at line 22. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--The reinforcement portion may be formed on an outside face of the jacket.--

Please substitute the following paragraph for the paragraph starting at page 7, line 23 and ending at line 25. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--The reinforcement portion may be formed at a position not interfering with relative motion of the magnet and the coil.--

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Please substitute the following paragraph for the paragraph starting at page 8, line 1 and ending at line 6. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--The reinforcement portion may be made integral with the jacket, and the reinforcement portion may be defined by a portion having a protruded shape with respect to a level of a portion of the jacket where the magnet and the coil are opposed to each other.--

a3

Please substitute the following paragraph for the paragraph starting at page 8, line 10 and ending at line 13. A marked-up copy of this paragraph, showing the changes made thereto is attached.

a4

--The protruded shape portion of the jacket may be defined by an inside recessed portion of the jacket where a portion of the coil is placed.--

Please substitute the following paragraph for the paragraph starting at page 8, line 13 and ending at line 16. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--At least one of an upper half and a lower half of a section of the jacket taken along a plane perpendicular to the driving direction may have a recessed shape portion.--

Please substitute the following paragraph for the paragraph starting at page 8, line 17 and ending at line 24. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--In accordance with another aspect of the present invention, there is provided a stage system, comprising: a movable stage; a linear motor having a magnet and a coil, for driving the stage; and a jacket having a reinforcement portion extending parallel to a driving direction, wherein the coil is enclosed by the jacket and wherein a cooling medium

flows through an inside space of the jacket.--

Please substitute the following paragraph for the paragraph starting at page 8, line 25 and ending at page 9, line 6. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--In accordance with a further aspect of the present invention, there is provided an exposure apparatus, comprising: a movable stage for holding a substrate thereon; a linear motor having a magnet and a coil, for driving the stage; and a jacket having a reinforcement portion extending parallel to a driving direction, wherein the coil is enclosed by the jacket and wherein a cooling medium flows through an inside space of said jacket.--

Please substitute the following paragraph for the paragraph starting at page 9, line 7 and ending at line 19. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--In accordance with a yet further aspect of the present invention, there is provided a device manufacturing method, comprising the steps of: applying a photosensitive material onto a substrate; exposing the substrate by use of an exposure apparatus having a movable stage for holding a substrate thereon, a linear motor having a magnet and a coil, for driving the stage, and a jacket having a reinforcement portion extending in parallel to a driving direction, wherein the coil is enclosed by the jacket and wherein a cooling medium flows through an inside space of the jacket; and developing the exposed substrate.--

Please substitute the following paragraph for the paragraph starting at page 12, line 27 and ending at page 14, line 9. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--Figure 1 is a perspective and exploded view of a jacket of a linear motor according to a first embodiment of the present invention. Figure 2 is a perspective view of an example of a combination of coils to be disposed within the jacket of Figure l. Figure 3 is a sectional view of a linear motor with the jacket of Figure 1, taken along a plane perpendicular to the driving direction. Figure 4 is a sectional view of the linear motor of Figure 1, taken along the driving direction. In these drawings, denoted at la is a flat coil, and denoted at 14 and l4' are jacket elements constituting a jacket. Denoted at 8 is a comb-shaped structure formed on the jacket elements 14 and 14'. The coil la through which an electric current flows is disposed inside the jacket defined by the jacket elements 14 and 14'. It is held fixed at recessed portions of the comb-shaped structure 8, defined by the jacket elements 14 and 14', by using an adhesive agent, for example. Denoted at lb is a bent coil wherein, as shown in Figure 2, a portion of the bent coil lb is placed into a void core portion of the flat coil la. There are a plurality of coils, being paired such as shown in Figure 2, which are arrayed and covered by the jacket. Although in Figure 1 there is only a flat coil la illustrated, a bent coil lb is provided there in the positional relation with the flat coil la as shown in Figure 2. The comb-shaped structure 8 includes base portions 11 which are formed on the opposed inside faces of the jacket, along a direction parallel to the driving direction, so as to be opposed to each other, as well as pillar portions 12 connecting the opposed base portions. The base portions serve to support the coils la and lb in a floating manner so that the coils float from the inside faces of the jacket. The pillar portions serve to hold the coils la and lb fixed with respect to the driving direction.--

Please substitute the following paragraph for the paragraph starting at page 14, line 10 and ending at page 15, line 2. A marked-up copy of this paragraph, showing the changes made thereto is attached.

a5 cncld.

--In Figure 3, denoted at 2 and 2' are yokes, and denoted at 3 and 3 are permanent magnets. A portion of the coils la and lb is disposed in a magnetic field that is produced by a magnetic circuit defined by the permanent magnets 3 and 3' and yokes 2 and 2'. When an electric current flows through the coils la and lb, the coils la and lb and the permanent magnets 3 and 3' are relatively driven in opposite directions, along a direction perpendicular to the sheet of the drawing. In the portion of Figure 3 where the magnetic field is produced (a region M in Figure 2), a portion of the bent coil lb is placed into the void core portion of the flat coil la. This effectively shortens the gap of the space where the magnetic field is produced. Therefore, it effectively increases the magnetic field. Further, since the opposite end portions of the bent coil lb are bent upwardly above the flat coil la, the jacket element 14' is formed with an inside recessed portion corresponding to the shape of the coil.--

Please substitute the following paragraph for the paragraph starting at page 15, line 11 and ending at page 16, line 1. A marked-up copy of this paragraph, showing the changes made thereto is attached.

a6

--The jacket elements 14 and 14' are sealingly fixed to each other by means of an adhesive agent or bolts. A temperature controlled cooling medium flows through the space between the jacket and the coils la and lb, to thereby collect heat generated by the coils la and lb. With this arrangement, any temperature rise of the coils la and lb themselves, as well as any temperature rise of a component mounted on the linear motor or of an environment thereof, can be prevented. The pillars 12 of the comb-shaped structure 8 formed on the jacket element 14 are

a6 cancel.

fixed to the base portions 11 of the jacket element 14'. This effectively prevents outward deformation of the jacket by the inside pressure of the cooling medium. The recessed portion of the jacket 14' accommodating the opposite ends of the bent coil lb serves to reinforce the small-thickness portion of the jacket where the magnetic field is applied.--

Please substitute the following paragraph for the paragraph starting at page 24, line 20 and ending at page 25, line 10. A marked-up copy of this paragraph, showing the changes made thereto is attached.

a7

--Step 1 is a design process for designing a circuit of a semiconductor device. Step 2 is a process for making a mask on the basis of the circuit pattern design. Step 3 is a process for preparing a wafer by using a material such as silicon. Step 4 is a wafer process (called a pre-process) wherein, by using the so prepared mask and wafer, circuits are practically formed on the wafer through lithography. Step 5 subsequent to this is an assembling step (called a post-process) wherein the wafer having been processed by step 4 is formed into semiconductor chips. This step includes an assembling (dicing and bonding) process and a packaging (chip sealing) process. Step 6 is an inspection step wherein an operation check, a durability check and so on for the semiconductor devices provided by step 5, are carried out. With these processes, semiconductor devices are completed and they are shipped (step 7).--

IN THE ABSTRACT

Please substitute the following Abstract for the Abstract starting at page 34, line 1 and ending at line 13. A marked-up copy of this paragraph, showing the changes made thereto is attached.